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A critique of science and Karl Popper's Swan Induction.

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Popper argues that we cannot definitively confirm the truth of a general law solely through repeated observations. For example, observing numerous white swans does not prove that all swans are white. However, the sighting of a single black swan is sufficient to refute the claim that all swans are white.

One problem with this statement is that it can be refuted (Black Swan and White Swan are not birds of the same species). The white swan (Cygnus olor) and the black swan (Cygnus atratus) are distinct species, with different genetics and habitats.

Cats, within their species, come in many different colors: gray, tabby, yellow, white, white, brown, black, with long or short fur, among others, and they all belong to the same species, Felis Catus.

The black swan and birds are animals. so different as not intersections. they called the swan the Europeans the same name could be created, there are many then to the parrot say the following parrot is medium and green, parrots (parrots, there are small yellow large parrots that is, the swan black

White swans are of species dry they do Aboriginal Peoples Maali's black man, if they had used phrase no longer I affirm this because similar birds It would be the same as form, not all

because they exist small parakeets), and (cockatiel), and red (macaw) White and the Swan

It's the same type of comparison.

The existence of Cygnus atratus (black) does not refute the genetic laws of Cygnus olor (white). It's like trying to refute a law about oxygen using the behavior of hydrogen just because both are gases.

The Black Swan and the White Swan are not color variations of the same species, as is the case with white, black, or yellow cats. Popper's theory would be the same as saying that not all parrots are large, as there are small parrots (like parakeets) and some that are even larger or red, as in the case of macaws. The Black Swan is a superficial and inductive observation that clings to the animal's form to give it the same name.

Popper used the example of swans to show that a scientific theory can be refuted by a single contrary observation (e.g., "all swans are white" → refuted by a black swan). From a biological point of view, this metaphor is limited, as the natural variability of species and evolutionary processes make the issue more complex. Crows fall into the same problem, as the genus Corvus, which includes crows and magpies, has 40 different species.

According to Popper, falsificationism, central concept in Karl's philosophy Popper proposes that science progresses through refutation, not of confirmation, the scientific process it does not begin with observations, but with the formulation of a hypothesis. The objective of It is a scientist's attempt falsify this hypothesis, and not check your in truth, emphasizes the importance of Critique and testing rigorous in method

opposing the idea scientific, advances that science through accumulation primarily of Confirmatory observations. Popper argued that science should not be limited to the passive observation of nature, but rather formulate hypotheses that can be tested and, above all, refuted. Although Popper defended this principle, the swan analogy was a superficial observation of nature, because in creating this principle he looked at the Black Swan and compared it to the White Swan as if they were biologically identical beings; he only looked at the form without considering the fact that they are animals of similar appearance. Look at a poodle, a German shepherd, a pinscher—they are all the same species, they are all dogs, and yet they have more differentiated forms than the two different species of swans proposed by Popper's analogy.

Popper induced the idea by observing only the surface and did not follow his own advice not to limit himself to passive observation of nature because he did not observe the science that differentiates both swans; that is, in creating the phrase about swans, Popper made a passive observation of nature.

The fact that Popper criticized precisely this "superficial observation" and argued that science should not try to "confirm" what it sees superficially, but rather create bold hypotheses that survive attempts at refutation, contradicted his observation that animals similar in shape but different in reality would be variations of the same being.

If we call different animals by the same name (Swan), our language creates an inductive trap. Science progresses precisely when the "Black Swan" (the new fact) forces us to revise our definitions and understand that reality is more complex than our initial sample allowed us to see.

To delve deeper into the distinction between names and categories, reading Karl Popper on Essentialism helps to understand why he rejected definitions based solely on "form" or "names."

The black swan is not a swan (not as Popper would have liked), just as a macaw is not a parrot. If the black swan were called a maali, the metaphor would be impossible. The existence of the black swan does not invalidate the fact that the white swan species is formed only by white swans; white and black swans do not even interbreed. From Popper's point of view, we could say that an Aboriginal philosopher might create the idea that, even if one observes thousands of black maali, finding a single white maali is enough to say that not all maalis are black, but he would only be falling into the same error.

Popper made only a superficial observation of nature and did not take genetic and organic science into consideration; I disagree with these points. I would only agree with Popper if the black swan were...

Chromatic variation of the same species, the black swan is to a Neanderthal as the white swan is to Homo sapiens, or vice versa.

This criticism is technically correct and hits the weakest point in the example used by Popper: the confusion between phenotype (appearance) and genotype (biological identity).

Popper's example attempts to be logical but not biological, but the fact that he does not use adequate criteria (observing the science involved in the example to be formulated) for formulating the sentence causes the logic to fall apart.

Karl Popper was not a biologist; he was a philosopher of logic. For him, the "Swan" was merely a variable in an equation: "All A is B." Even so, to assume logic, it would be appropriate to look at the biology of the swan and the maali before formulating the sentence.

• If A (Swan) is defined by biology as a specific species (Cygnus olor), then an animal of another species (Cygnus atratus) cannot be used to refute the color of the first.

• If species do not interbreed and are genetically distinct, the existence of one does not invalidate the genetic properties of the other. It's like saying that the existence of a black bear invalidates the fact that polar bears are white. Polar bear (Ursus maritimus) and black bear (Ursus americanus)

I would like to point out that although both belong to the Ursidae family and the Ursus genus, they are different species and are not genetically compatible for reproduction.

An analogy with Neanderthals and Homo sapiens is perfect: they are distinct groups within the same genus (Homo).

To say that "man is always brown-eyed" would not be refuted by the discovery of an extinct cousin species, but rather by variation within the Homo sapiens species itself.

Modern science works with the concept of clade and speciation. If Popper wanted to be scientifically rigorous, he should have said:

"The hypothesis that the allele for black coloration does not exist in the gene pool of the species Cygnus olor remains valid until a specimen of this species presents such a mutation."

Popper's hypothesis could be based on the fact that Black Maali are born albino or that a genetic mutation produces the birth of a White Swan, resulting in the birth of Black, Gray, or any other color.

By ignoring the reproductive and genetic barrier, Popper made an error of undue generalization (the same error he was trying to combat), treating "swan" as a universal semantic category and not as a discrete biological entity.

Modern science demands a rigor that surpasses the elegance of philosophical metaphors. His critique touches on the core of the evolution of the scientific method in 2026: the transition from purely verbal logic to genetic and molecular rigor.

The Refutation of the Refutation

If Popper says that the Black Swan refutes the theory "all swans are white," he makes a mistake in taxonomic categorization. In current biology:

• The existence of Cygnus atratus (black) does not refute the genetic laws of Cygnus olor (white).

• Therefore, Popper's "proof" is actually a false equivalence. It's like trying to refute a law about oxygen using the behavior of hydrogen simply because both are gases.

I believe that adherence to the scientific theory proposed by Karl Popper may somehow make

Invalid human knowledge, techniques, and methods that have value for the progress and well-being of humanity, therefore a way must be found that offers a more realistic view of scientific practice. Science advances through paradigm shifts, not just refutation; scientific development is historical and social, marked by periods of normal science and revolutionary ruptures. Science cannot offer fixed rules because the diversity of scientific methodologies alongside creativity is essential to ending scientific rigidity.

I'm not criticizing science, just questioning it without any intention of disrespect. Science is one of humanity's greatest achievements, responsible for advances that have radically transformed our way of life. However, when it becomes dogma, it loses precisely what makes it valuable: the ability to question, revise, and reinvent itself. The so-called scientific rigidity is criticized by various thinkers, philosophers, and even scientists, who warn of the risks of treating science as an absolute and unquestionable truth.
One of the main criticisms is the loss of critical thinking. Science was born from a spirit of doubt and a willingness to refute hypotheses. When it becomes rigid, it begins to behave like a dogmatic religion, where certain ideas cannot be questioned.

Other reduction

the point is from the Complexity. Scientific dogmatism tends to simplify phenomena.
complexities, ignoring philosophical, social, and cultural dimensions. By stating that "science has all the answers," it disregards the fact that many aspects of human existence cannot be reduced to measurements or experiments.
There is also the exclusion of other forms of knowledge. Traditional, philosophical, or spiritual knowledge is often dismissed as "unscientific." This stance creates an artificial hierarchy where only knowledge validated by scientific methods is considered legitimate.

marginalizing other perspectives.
The risk of authoritarianism is another relevant aspect. The discourse that "science cannot be questioned" can be used to justify policies or practices that leave no room for debate. This generates a form of authoritarian scientism, in which science ceases to be a tool for investigation and becomes an instrument of power.
Finally, there is the illusion of completeness. The belief that science already possesses all the answers is illusory. History shows that theories once considered definitive have been superseded, such as geocentrism or classical determinism. Science is a constantly evolving process, not a finished building.
Acknowledging the limits of science does not mean denying its importance. On the contrary: it is precisely this humility that guarantees its vitality. Science needs to remain open to the new, the unexpected, to what does not fit into current models. Questioning does not weaken science, but strengthens it, keeping its critical essence alive.
In short, criticism of scientific rigidity is not an attack on science, but a warning against its transformation into dogma. True science is that which accepts being questioned, recognizes its limitations, and engages in dialogue with other forms of knowledge.

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